8th IUCN ACADEMY OF ENVIRONMENTAL LAW COLLOQUIUIM
Ghent, Belgium, 14-16 Sept 2010

"LINKAGES BETWEEN BIODIVERSITY AND CLIMATE CHANGE"

BIODIVERSITY AND CLIMATE CHANGE:
CHALLENGES FOR CITIES
& PERSPECTIVES FROM SINGAPORE

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Presentation outline

- Exploration of links between Biodiversity and climate change laws
- The CBD – obligations on state parties
- Singapore – highly urbanised, from "Garden city" to "City in a Garden"
- Critique – severe loss of biodiversity
- Climate Change concerns?
- Singapore's Proposal to CBD – Cities Index of Biodiversity, 2010
- Conclusion – links with Climate Change?

Biodiversity and Climate Change Laws

- Both CBD and UNFCCC presented for signature at UNCED, Rio, 1992
- Neither refers to the other; each was developed independently of the other
  - CBD : IUCN & UNEP
  - UNFCCC : World Meteorological Organisation, Inter-governmental panel on CC

*Common areas – sustainable development; 'common but differentiated responsibilities'

Links between Biodiversity and Climate Change

- Millennium Ecosystem Assessment - climate change likely to become one of the most significant drivers of biodiversity loss by the end of the century
- Conserving natural terrestrial, freshwater and marine ecosystems and restoring degraded ecosystems (including their genetic and species diversity) is essential for the overall goals of both CBD and UNFCCC.
- Conserved or restored habitats can remove carbon dioxide from the atmosphere, thus helping to address climate change by storing carbon
- Conserving in-tact ecosystems, such as mangroves, for example, can help reduce the disastrous impacts of climate change such as flooding and storm surges
- Ecosystem-based adaptation, can be cost-effective and generate social, economic and cultural co-benefits and contribute to the conservation of biodiversity.

Govt obligations under CBD : I. National Obligations

- Under the Convention, governments undertake to conserve and sustainably use biodiversity.
- They are required to develop national biodiversity strategies and action plans, and to integrate these into broader national plans for environment and development.
- This is particularly important for such sectors as forestry, agriculture, fisheries, energy, transportation and urban planning

Other treaty commitments include:

- Identifying and monitoring the important components of biological diversity that need to be conserved and used sustainably.
- Establishing protected areas to conserve biological diversity while promoting environmentally sound development around these areas.
- Rehabilitating and restoring degraded ecosystems and promoting the recovery of threatened species in collaboration with local residents.
- Respecting, preserving and maintaining traditional knowledge of the sustainable use of biological diversity with the involvement of indigenous peoples and local communities.

Other Govt obligations under CBD (contd)

- Preventing the introduction of, controlling, and eradicating alien species that could threaten ecosystems, habitats or species.
- Controlling the risks posed by organisms modified by biotechnology.
- Promoting public participation, particularly when it comes to assessing the environmental impacts of development projects that threaten biological diversity.
- Educating people and raising awareness about the importance of biological diversity and the need to conserve it.
- Reporting on how each country is meeting its biodiversity goals.

Article 6 – General Measures for Conservation and Sustainable Use

- Each Contracting Party shall, in accordance with its particular conditions and capabilities:
- (a) Develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity or adapt for this purpose existing strategies, plans or programmes which shall reflect, inter alia, the measures set out in this Convention relevant to the Contracting Party concerned; and
- (b) Integrate, as far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans, programmes and policies.

Surveys - database

- One of the first steps towards a successful national biodiversity strategy is to conduct surveys to find out what biodiversity exists, its value and importance, and what is endangered.

  Eg. Red Data Books
- On the basis of these survey results, governments can set measurable targets for conservation and sustainable use.
- National strategies and programmes need to be developed or adapted to meet these targets.

Singapore – 700 sq km

From “Garden City” to “City in a Garden”

SINGAPORE'S ENVIRONMENT

I. Quality of living ranking– Mercer's Quality of Living Index 2010 – 221 cities ranked, base city New York

- http://www.mercer.com/qualityoflivingpr#City_Ranking_Tables

  - Sydney - No. 10

  - Singapore - No. 28 (highest ranking Asian city)

  - Vienna : No. 1

II. Mercer's Eco-City ranking – based on water availability, water potability, waste removal, sewage, air pollution and traffic congestion.

  - Singapore No. 22

  - Sydney No. 46 (top city Calgary, Canada)

The Bradshaw, Giam and Sodhi Study May 2010 PloS ONE

- Recent study - “Evaluating the Relative Environmental Impact of Countries”, Bradshaw, Giam and Sodhi
- 170 countries studied for natural forest loss, habitat conversion, marine captures, fertiliser use, water pollution, carbon emissions and species threats.
- Named Singapore as the country with the worse environmental proportional impact (relative to resource availability)
- See http://www.plosone.org/article/info:doi%2F10.1371%2Fjournal.pone.0010440

"The Natural Heritage of Singapore", 3rd ed. 2010;

Hugh Tan, Chou LM, Darren Yeo, Peter Ng

- More than 95% of original forest cover (578 sq km) has been cleared
- Less than 10% of remaining 28.6 sq km is primary forest
- Extinction rates of 34 - 87% occurred in forest specialists such as butterflies, freshwater fish, birds and mammals
- Present forest reserves cover 5% of total land area, harbour over 50% of remaining native biodiversity
- Marine biodiversity – "abundance rather than species richness has been affected"
- Alien species – many have adapted successfully
- New species (plants and animals) continue to be discovered
- Some species thought to be extinct have returned

Government's response to *Bradshaw, Giam and Sodhi Study*

- Study used a proportional environmental impact index which is defined only in terms of total land area;
- Cities with limited land size and high intensity of land use would be necessarily disadvantaged and must be treated differently.
- Singapore has taken many steps to bring back its biodiversity, increasing its green cover from 35.7% to 46.5% between 1986 and 2007,
- Singapore has set aside close to 10 % of its total land area for parks and nature reserves

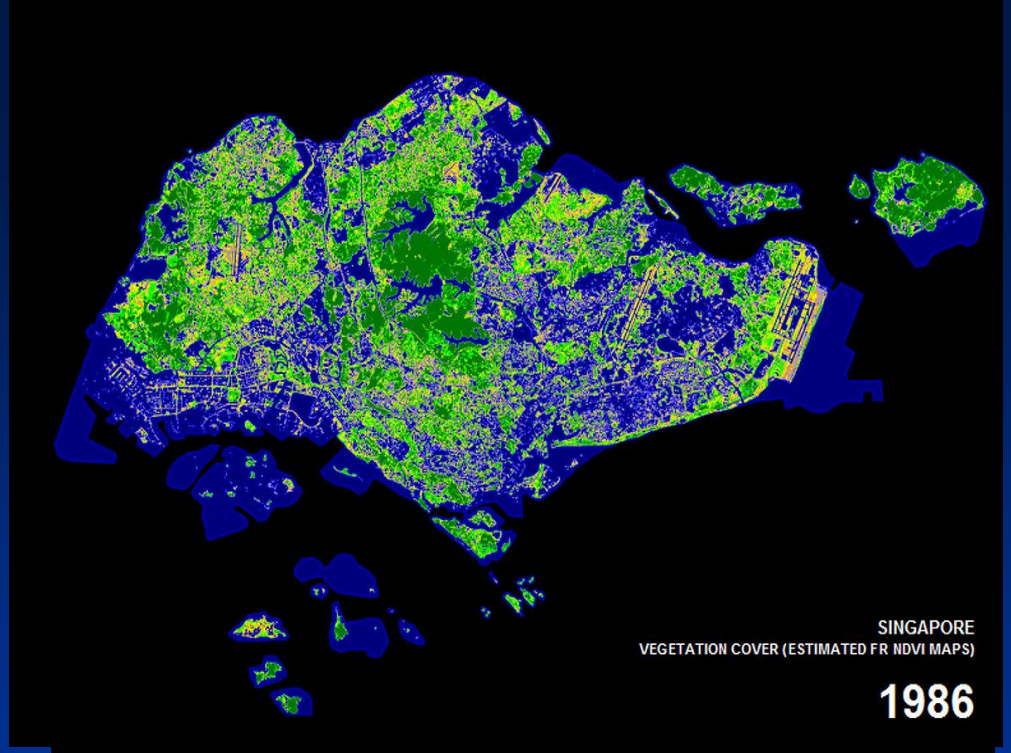
From “Garden City” to “City in a Garden” - vision and political will

- Lee Kuan Yew “In wooing investors, even the trees matter” – 1 August 1996, 35th Anniversary of the Economic Development Board
- “We have built. We have progressed. But there is no hallmark of our success more distinctive and more meaningful than achieving the position as the cleanest and greenest city in South-east Asia.”

  – Mr. Lee Kuan Yew, Prime Minister of Singapore,at the launching ceremony of the “Keep Singapore Clean” Campaign, 1 October 1968
- "I have always believed that a blighted urban landscape, a concrete jungle, destroys the human spirit. We need the greenery of nature to lift up our spirits." October 1995, Opening of National Orchid Garden

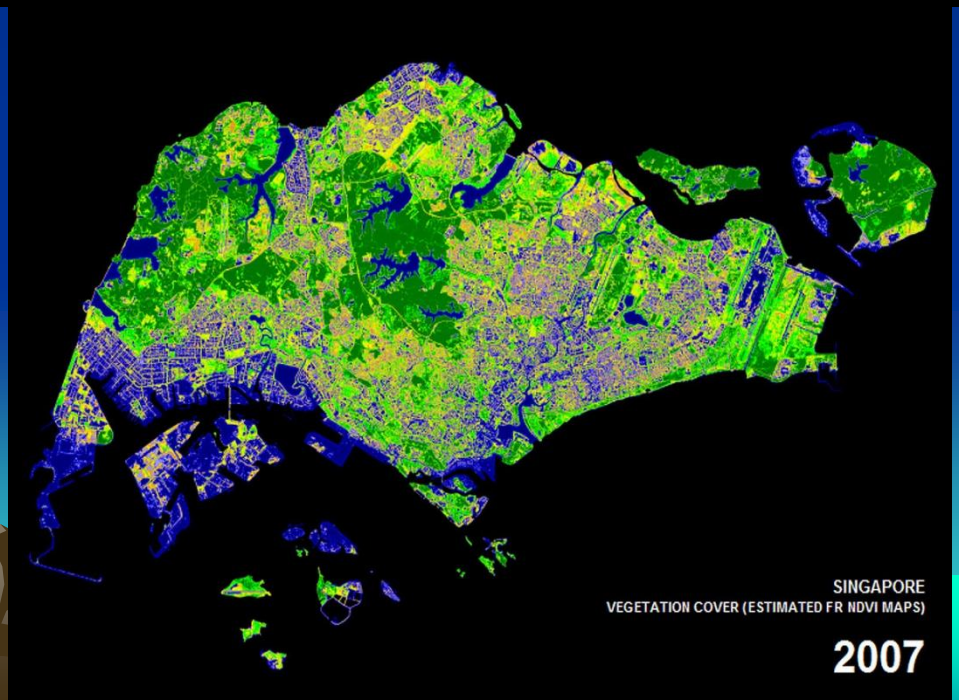
1986

- Population 2.7 million
- Greenery 36%



2007

- Population 4.6 million
- Greenery 47%



Oriental Pied Hornbill returns to Singapore after 50 years
http://www.nparks.gov.sg/biodivercity/

Singapore's Response to Climate Change

- 1 April 2001 – establishment of National Energy Efficiency Committee by Ministry of Environment & Water Resources
- 2006 - Renamed Climate Change Committee when S'pore planned to accede to Kyoto Protocol

Terms of Reference of Climate Change Committee

To address climate change by:

- a) Promoting greater energy efficiency and less carbon-intensive energy in key sectors;
- b) Raising awareness amongst the people, private and public sectors on the impacts and opportunities arising from climate change, and the actions they can take;
- c) Building competency in Singapore to better respond to climate change such as through promoting research and development of low-carbon technologies;
- d) Understanding Singapore's vulnerability to climate change and facilitating the adaptation actions needed.

The NCCC Main Committee is assisted in its work by four sub-committees and five workgroups,

- a) Building Sub-committee
- b) Households Sub-committee
- c) Industry Sub-committee

  i) Electronics Workgroup
  ii) Wafer Fabs Workgroup
  ii) Pharmaceuticals Workgroup
  iii) Chemicals Workgroup
- d) Transportation Sub-committee
- e) R&D Workgroup

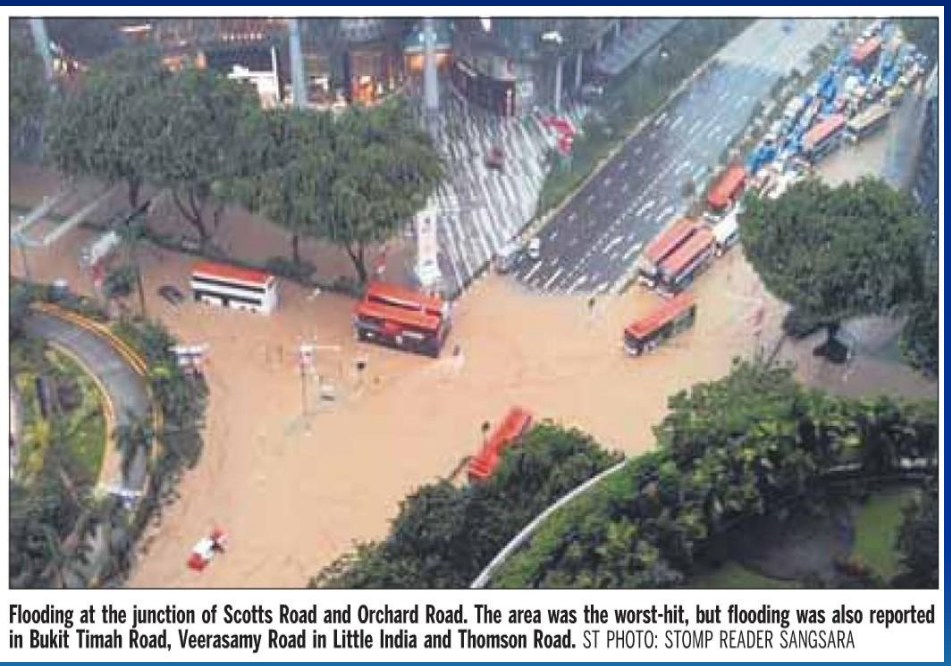
Singapore's National Climate Change Strategy, 2008

- Concerns – low-lying, densely populated
- Vulnerability & adaptation efforts
- Govt commissioned a study to project:

  (i) the climate change effects such as the changes in temperature, sea level and rainfall patterns in Singapore, and

  (ii) the resulting impacts such as increased flooding and impacts on water resources.

Singapore – Climate Change?
Flash floods 2010



Flooding at the junction of Scotts Road and Orchard Road. The area was the worst-hit, but flooding was also reported in Bukit Timah Road, Veerasamy Road in Little India and Thomson Road. ST PHOTO: STOMP READER SANGSARA

Singapore's Climate Change Strategy – Mitigation Efforts

1. Mitigate GHG emissions by:-
   - *Using Less Carbon-Intensive Fuels*
   - *Increasing Our Energy Efficiency*
2. National Environment Agency (NEA) chairs the Energy Efficiency Singapore Programme Office (E2PO) comprising members from

- EMA, EDB, LTA, BCA and A*STAR

Q – link to biodiversity? No mention of restoration of mangroves that were destroyed etc.

But Singapore Green Plan 2012 mentions "Reforestation of degraded areas & reintroduction of indigenous species into forests"

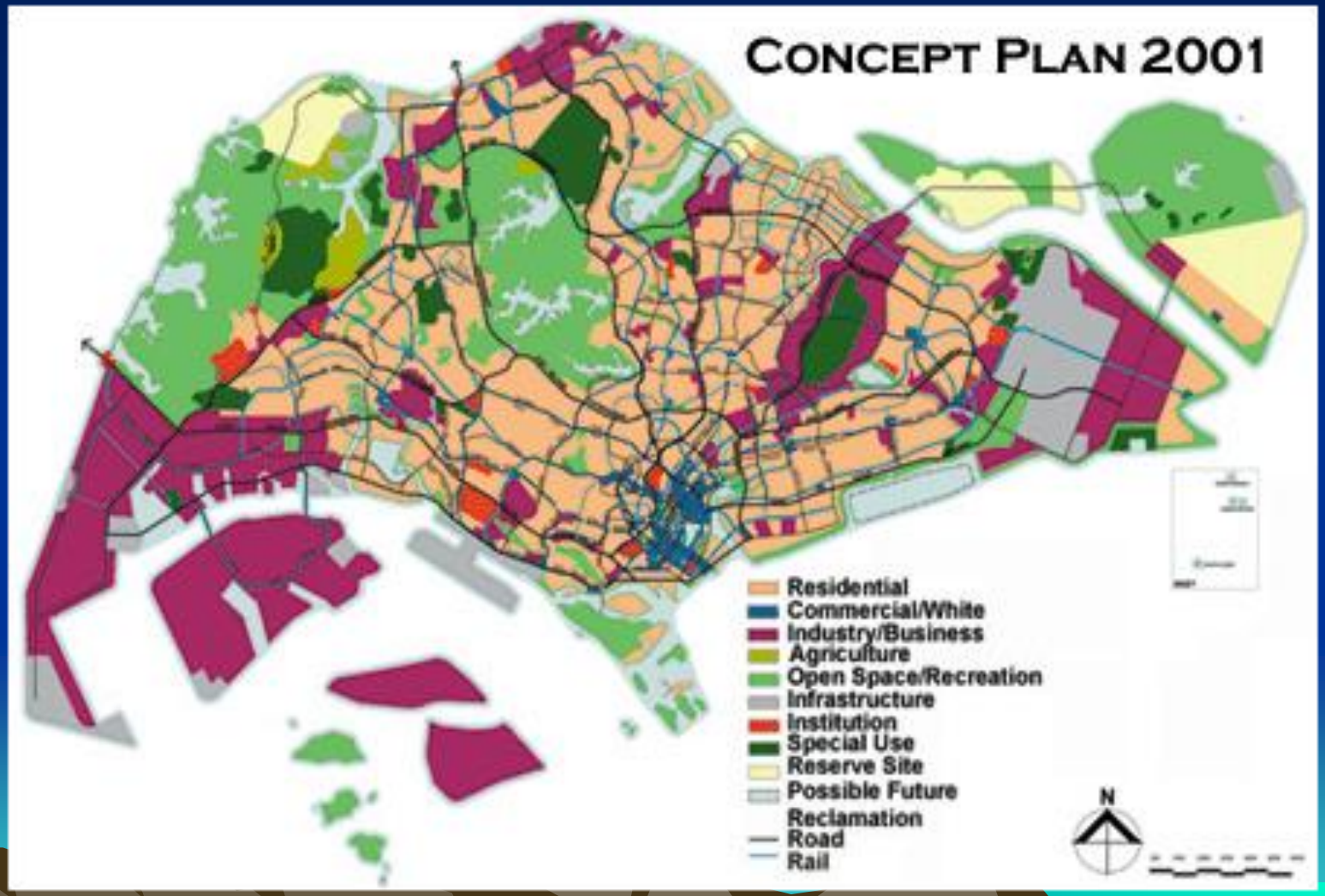
Promoting energy efficiency

- The E2PO has developed a national plan
- to promote energy efficiency, also known as Energy Efficient Singapore (E2
- Singapore).
- E2 Singapore's proposals include adoption of energy efficient technology, R & D into clean and renewable energy, build skills on energy management, capabilities and services and carbon consultancy services

Land use planning, Governance and Management

1. 1958 statutory Master Plan – zoning, plot ratios
   - reviewed every 5 years
2. 1971 Concept Plan – projecting land use 20 years ahead to 1991, anticipates growth, land needs, infrastructure planning, transportation, utility installations, sewage treament plants, waste disposal sites etc
3. 1991 Revised Concept Plan – “A Tropical City of Excellence”
4. 2001 Concept Plan “Towards a Thriving World Class City”
5. 55 Development Guide Plans – intensive, each serving population of 150,000 served by a town centre
6. Latest Master Plan 2008
7. Working on Concept Plan 2011

SINGAPORE


CONCEPT PLAN 2001
Residential
Commercial/White
Industry/Business
Agriculture
Open Space/Recreation
Infrastructure
Institution
Special Use
Reserve Site
Possible Future
Reclamation
Road
Rail
N

The Singapore Green Plan 1992

- First Singapore Green Plan 1992 – presented at Rio Summit

  - keep 5% as nature areas; only 3.75% legally protected.

- 19 sites identified as conservation areas, monitored by National Parks Board.
- 4 areas of coral reefs identified for conservation : St John's Island, Pulau Hantu, Pulau Semakau, Pulau Sudong.

- Workgroup 5 (on Nature Conservation) stated "...the existing legislative, enforcement and administrative arrangements are adequate to ensure proper protection of these marine coral areas."
- The reality?

SGP 2012 (2006 edition)

- Keep sites identified as nature areas “for as long as possible”.
- Verify and update information on indigenous flora and fauna through biodiversity surveys.
- Put in place new parks and park connectors.
- Set up a National Biodiversity Centre (established in May 2006)
- Reforestation of degraded areas & reintroduction of indigenous species into forests

Concept Plan 2011 Review

1. Launch of Concept Plan 2011 Review, Public Consultation Exercise, 24 January 2010.
2. Key Objectives include:-

- Economic growth opportunities,
- Good quality living environment,
- A sustainable Singapore that balances growth with responsible environmental management
- An inclusive society where the needs of various sectors of the population are taken care of

Singapore's Proposal - A Biodiversity Index for Cities

- CBD's Executive Secretary Dr. Djoghlaf called for cities to share and pool knowledge, develop new approaches, methods and tools
- May 2008, S'pore's Minister for National Development proposed that Parties collaborate in developing a CBD-led "city biodiversity index"
- February 2009, Singapore hosted with the Secretariat of CBD the first expert workshop on the development of the City Biodiversity Index

Singapore's Initiative- Cities Biodiversity Index

- Prepared by NParks, Singapore, proposed 28 May 2008, Bonn, meeting of CBD
- To assist cities in benchmarking their conservation efforts for biodiversity
- 1st workshop – Feb 2009 Singapore, Users Manual prepared
- 15 cities have tested the Index
- 2nd workshop – July 2010, Singapore, to evaluate testing
- October 2010 – seek endorsement by CBD COP-10, Nagoya

Singapore's Initiative for CBD – A Cities Biodiversity Index*

Why this Index?

- 2008: > 50% of people live in cities
- 2050: > 70% will live in cities
- 2025: 26 megacities with population of > 10 million each (22 from developing countries)
- Increase in cities' ecological footprint
- Limitation of current indices
- *

Presented by Nparks at Second Curitiba Meeting on Cities and Biodiversity, Curitiba, Brazil, 6-7 January 2010

Workshop's objectives are to develop a city biodiversity index to:

- Assist national governments and local authorities in benchmarking their biodiversity conservation efforts in the urban context
- Help evaluate progress in reducing the rate of biodiversity loss in urban ecosystems

Proposed index: a self-assessment tool that is:-

- easy to apply
- scientifically credible
- objective and fair

Singapore'sProposed
Cities Biodiversity Index

Three components for the Index:

1. Native biodiversity in the city
2. Ecosystem services provided by native biodiversity in the city
3. Governance and management of native biodiversity in the city

How was the Biodiversity Index for Cities Developed?

Technical Task Force:

- Dr. Nancy Holman, London School of Economics
- Mr. Peter Werner, Institute of Housing and Environment, Darmstadt, Germany
- Professor Thomas Elmqvist, Stockholm Resilience Centre
- Mr. Andre Mader, ICLEI-Local Government for Sustainability
- Ms. Elisa Calcaterra, IUCN
- Mr. Oliver Hillel, Secretariat of the CBD
- Dr. Lena Chan, NParks

The Singapore Index is posted on website of CBD

11 Indicators for Biodiversity in the City

1. % of natural/ semi-natural areas
2. Diversity of ecosystems
3. Fragmentation measures
4. Native biodiversity in built-up areas

5 –9. Native Species –Plants, Birds, Butterflies and 2 other species

10. % of protected areas
11. Proportion of invasive alien species

The Singapore Index –
5 Indicators for Ecosystem Services

1. Freshwater services (cost for cleaning water)
2. Carbon storage (no. of trees in the city)
3. Recreation and education services (no. of visits/ person/ year)
4. Area of parks and protected areas/ population of city
5. Number of educational visits to parks or nature reserves per year (under 16 years/ year)

The Singapore Index – 9 Indicators for Governance and Management

1. Budget allocated to biodiversity projects
2. No. of biodiversity projects and programmes organised by the city annually
3. Rules, regulations and policy
4. No. of institutions covering essential biodiversity-related functions
5. No. of inter-agencies coordinating
6. Existence of a consultation process
7. Existence of partnerships
8. Incorporation of biodiversity into the school curriculum
9. No. of outreach programmes and public awareness events

The Singapore Index – Cities Testing the Index

I. Cities that have evaluated their data availability

   Brussels, Curitiba, Edmonton, Joondalup, Montreal, Nagoya, Singapore

2. Cities that have agreed to test-bed

   European cities in the IUCN/ Countdown 2010 project, Frankfurt, Paris, King's County (USA)

3. Cities that have been sent invitations to test-bed
   Adelaide, Gold Coast, Hannover, Melbourne, Oslo, Seattle, Tainan City (Taiwan), Vancouver

The Cities Biodiversity Index – Singapore's Experience in Testing the Index To-Date (1)

* Definitions –clarity eg. "protected areas" (Ind.10)

* Fragmentation measures - Minimum patch size?

* Native species - Scoring system for other taxonomic groups

* Freshwater services - Difficulty in obtaining data

The Singapore Index – Singapore's Experience in Testing the Index To-Date (2)

1. Budget allocated to biodiversity projects

   –for Singapore, total budget of the city = country,

   - may need to exclude defence, infrastructure, health and education

2. Rules, regulations and policy not applicable to Singapore? Focus on Local Biodiversity and Strategy Action Plan (LBSAP)
3. Institutional Capacity (no. of agencies involved / inter-agency coordination related to biodiversity) - Consider no. of inter-agency coordination initiatives rather than no. of agencies involved in coordination

The Singapore Index – Singapore's Experience in Testing the Index To-Date (3)

1. Participation and Partnership (existence of a consultation process) - focused on process rather than substance; to reconsider the scoring system

2. Education and Awareness-Raising - Focused on process rather than substance

3. Can the city influence national school curriculum?

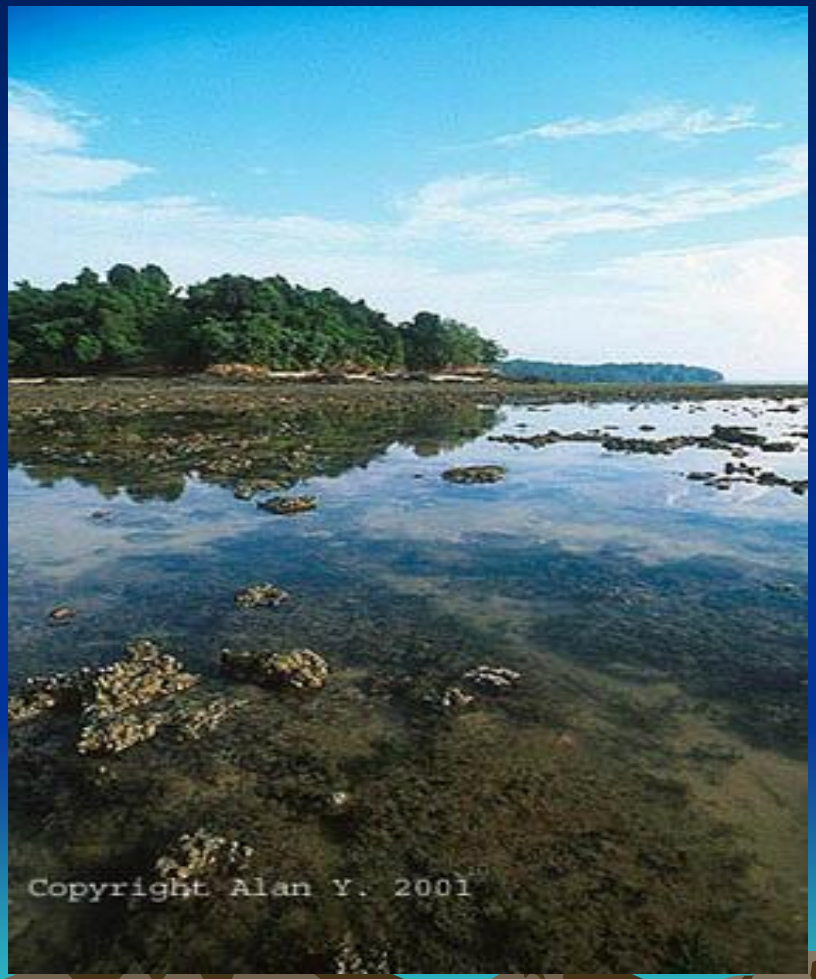
The Singapore Index – Next Steps

1. Broaden the geographical representation of cities testing the index
2. Engage more partners to contribute their data and share their experience in test-bedding
3. Review indicators in July 2010
4. Explore potential applications

   - Guidelines on how to enhance native biodiversity
   - Provision of biodiversity inputs into the master planning of cities
   - Basis for calculation of economic value of biodiversity and ecosystem services
   - as the biodiversity component of other indices

Source : http://www.cbd.int/authorities/doc/mayors-02/Wendy-Yap-en.pdf

Chek Jawa



Dr Tan Wee Kiat, 1995, Director, National Parks Board

- “The pressure to regard the nature reserves as a land bank to draw upon for development will intensify... The fate of nature conservation in Singapore will very much depend upon the political will, which in turn is shaped by the priorities of the people of Singapore."

Chek Jawa, Pulau Ubin, Singapore 2007

Some conservation initiatives by NParks

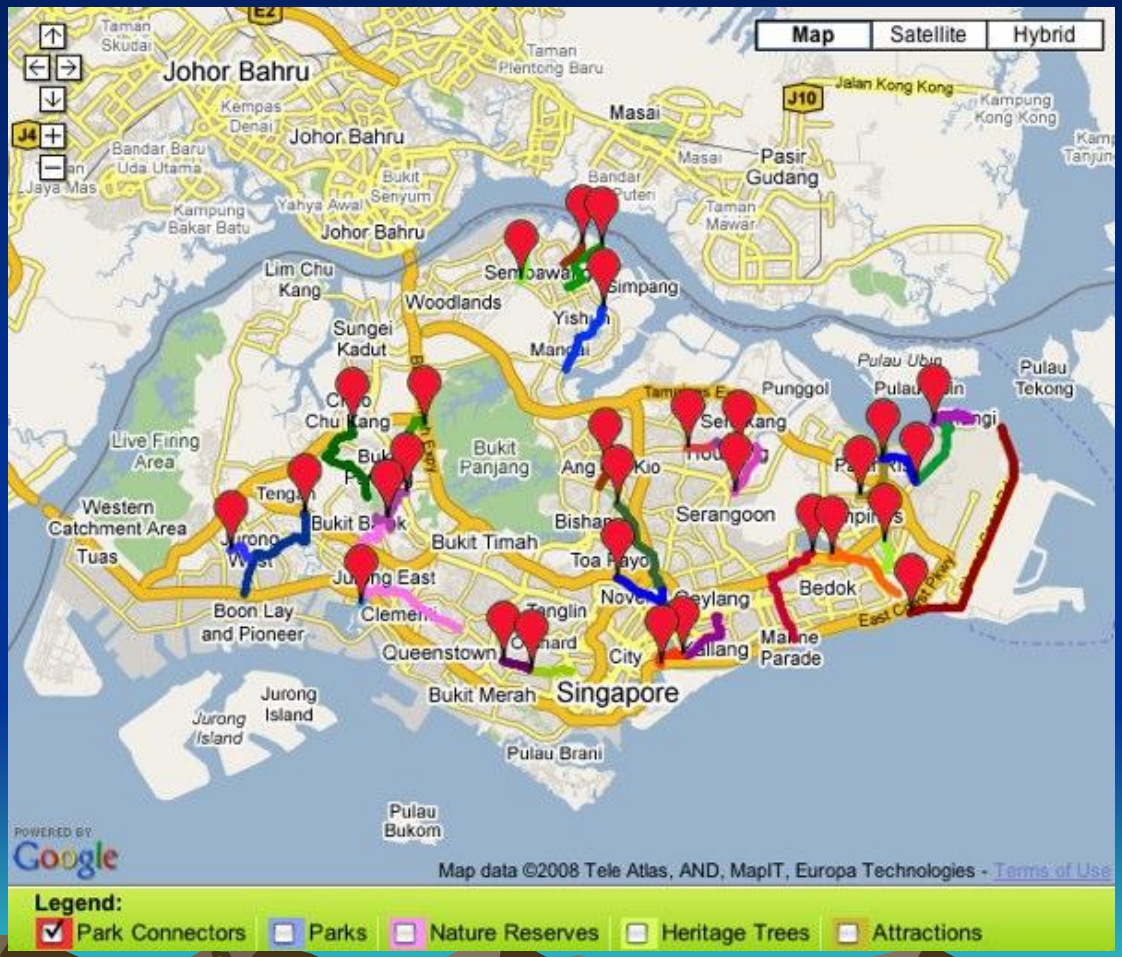
- Bird Banding Programme In Pulau Ubin
- Banded Leaf Monkey Conservation
- Butterfly Garden at HortPark
- Biodiversity and Distribution of Intertidal Sponges in Singapore Waters
- Creating Butterfly-Friendly Habitats
- Creating Dragonfly Habitats
- Coral Nursery
- Coral Reef Surveys
- Dipterocarp Arboretum at Yishun Park
- Forests of Giants
- Hornbill Conservation Project
- Rescuing A Rare Dragonfly
- Seagrass Monitoring
- Seahorse Monitoring Project
- Singapore Red Data Book 2008
- The Singing Forest

Types of Parks in Singapore

1. City and Heritage Parks – 11
2. Horticultural Parks – 1
3. Hill ridges parks – 4
4. Riverine parks – 8
5. Community parks – 11
6. Nature parks – 6
7. Botanic gardens – 2 including Orchid Gardens
8. Coastal parks – 6
9. Offshore island – Ubin

http://www.nparks.gov.sg/cms/index.php?option=com_visitorsguide&task=parks&Itemid=73

SINGAPORE – PARK CONNECTORS

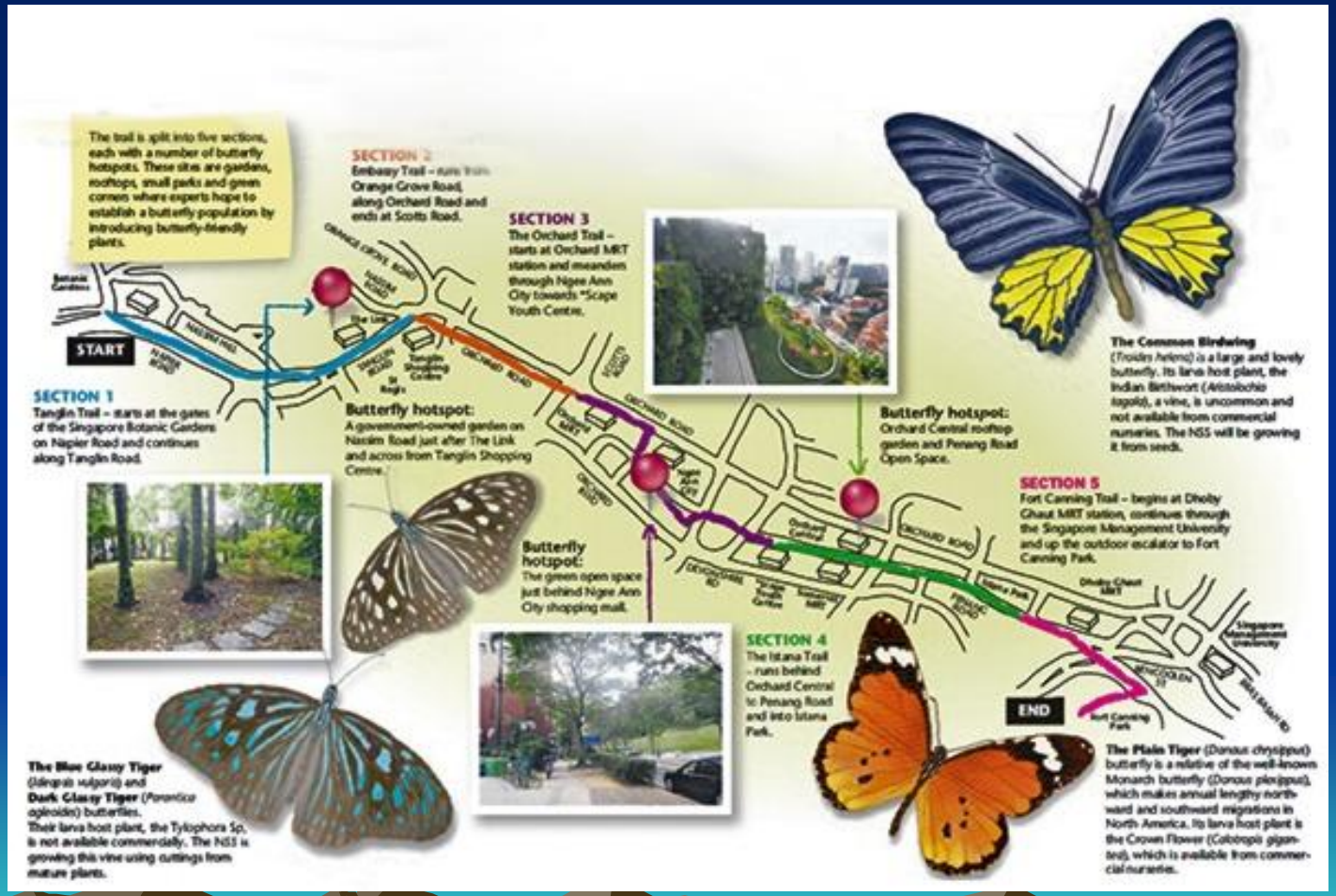


Tree Top walk, Telok Blangah

Heritage Roads, Singapore
Arcadia Road and The Arcadia

Roof top gardens and vertical greenery

Urban Butterfly Trail – launched June 2010
Botanic Gardens to Orchard Road to Fort Canning, 4 km



Conclusion

- Singapore has taken steps to address loss of biodiversity, but feels acutely the tension between conservation and development
- Now emphasises need for cities to preserve biodiversity & document records through a Biodiversity Index
- Main concerns for Singapore re: climate change are - sea level rise and GHG emissions; impacts on economy & livelihoods
- “Uniquely Singapore” – relevance for other cities?
- ,